Secretary's Mathematics and Science Initiative Teacher Knowledge Working Group
Issues Identified at March 13, 2003 Meeting

	Content Knowledge & Teaching Skills	System Supports	Gaps in Research
Preservice	There needs to be a diverse and talented pool of students entering teaching and efforts are needed to encourage this. There is no agreement on the nature of the deep mathematical knowledge that elementary and middle school teachers need. Need to increase rigor of preservice programs, even with shortages of people interested in teaching mathematics. Most pre service programs do not provide elementary and middle school with sufficient content knowledge in mathematics. Teachers need strong grounding in child development and human cognition and this need to be a part of their preservice program. Dispositions necessary to be successful in mathematics need to be a part of teacher preparation programs. For example, persistence with problems when the answer is not immediately known; the joy that comes from solving complex problems. The role of technology in changing the nature of what should be taught and how it should be taught needs to be explored. IHE Departments of Mathematics need to become more involved in preparing elementary and middles school teachers and view it as one of their important responsibilities. Mathematics departments need to model good teaching strategies.	Universities need to change in fundamental ways to bridge the cultural divide between arts and science faculty and schools of education. There is a lack of respect between A&S and Education. This needs to be done by senior university officials who demonstrate their commitment to teacher strong academic preparation for teachers. Rewards and incentives for university faculty do not respect work with teacher and schools. Better assessments for prospective teachers are needed that are aligned with content and performance standards. Uniform certification standards are needed for grade spans k-5, 6-8, 9-12. State certification standards do not emphasize content expertise. For example, elementary certified teachers can teach middle school math with little math expertise. They need to be changed to reflect this. State accreditation of higher education programs often mandate what course should be taught. Instead they should mandate outcomes for students. Given our mobile population, there should be a national certification system. Universities need to be accountable for the quality of their graduates. School systems only hire and place teachers with appropriate content expertise. Preservice experiences in schools should include work in mathematics.	

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	An examination should take place of what preparation is needed for students intending to teach high school mathematics.		
Induction	The content and teaching skills support that beginning teachers need should be carefully thought out. A system needs to be in place to provide that support. Support in content knowledge needs to be among the supports available for beginning teachers. Specific and transparent expectations need to be established for beginning teachers in their mathematical knowledge and teaching skills.	The transition from university to teaching in the schools is often not smooth, and both institutions need to take responsibility for support of beginning teachers. Data are needed on students coming out of universities and their effectiveness in classrooms. In this case, attention to their mathematics teaching should be collected. Novice teachers need individual mentors. Expertise in teaching mathematics should be available from a mentor. Schools should place novice teachers in settings where they are most likely to be successful, rather than in the most difficult situations, as is often the case. Time needs to be provided during the school day for mentoring and on-going support of novice teachers.	
Inservice And Retention	Professional development needs to be job embedded (related to content and pedagogy and provided for during the school day) and based on standards that are tied to incentives that include content, pedagogy, assessment, technology, and teaching diverse students.	Coherent school and district plans of professional development are needed that focus on instruction. Plans should be data driven. School environments are needed that allow teachers to reflect on and change their work.	

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	Professional development is often fragmented and irrelevant, and must instead be sustained and coherent. Professional development must be provided using multiple approaches—e.g. institutes with follow-up on line, using new technologies such as videos. There needs to be an understanding of the on-going and changing needs of teachers for professional growth. Clarification is needed on what mathematical knowledge is needed by whom and when. A mapping of this is needed. Much of professional development should be job-embedded and relevant to classroom practice. An assessment system, including on line training opportunities, is needed that allows teachers to identify and fill gaps in knowledge and skills in a convenient and effective manner. Teachers need to understand how to teach so that students have mastered the material. Technology needs to be incorporated in the delivery of mathematics instruction, professional development plans, and in service models. How this technology is best utilized needs to be studied. Teachers' editions of textbooks should include sections that explain the mathematics to teachers.	Better cooperation is need between IHEs and schools in supporting on going professional growth of teachers. Mathematics faculty members need to be involved. There is a need for on-going coaching and support built into the system. Teacher assessment systems are needed that are tied to individuals and go beyond coursework and test scores. Accountability systems that measure the impact of professional development on practitioners and students are needed. Specific efforts to retain mathematics teachers are needed and should include differential pay, improved working conditions, and opportunities for professional growth and respect. The strongest teachers should be assigned to teaching the students most at risk of educational failure. Financial and other incentives should be provided. Building leaders need to understand and support strong mathematics instruction. Time needs to be provided for professional growth. Recertification requirements need to be leveraged and used more effectively and tied to improving student learning. Effective partnerships with business and industry that enhance teachers' professional growth are needed.	

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	Problem solving, enrichment and other activities that motivate students to enjoy and appreciate mathematics are needed and teachers should be supported in offering these activities.		
Career Changers	A system is needed to assess the knowledge and skills of career changers. The system should be flexible and include knowledge and skills at the elementary, middle and high school levels. Support and direction on how to fill in gaps in knowledge and skills should be a part of the system. Relevant and succinct professional development opportunities are needed to prepare career changers to go into the classroom. Structured classroom experiences should be included so that they are exposed to the realities of schools. There needs to be a clear articulation of what core knowledge standards are necessary to attain certification in which high standards of mathematics knowledge are a part.	There is often a mismatch between IHE teacher training and the needs of career changers. Policies and administrative restrictions often impede the transition to teaching from other careers. These need to be reviewed and revised. Paraprofessionals can be nurtured to enter teaching with appropriate support. National certification should be available for career changers so that they can move around the country to where the greatest needs for mathematics and science teachers are.	

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Lead Teachers/Mentor Teachers			